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EXAMINER	
STRANGE, AARON N	
ART UNIT	**PAPER NUMBER**
2153	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/030,342	O'BRIEN ET AL.	
	Examiner	Art Unit	
	AARON STRANGE	2153	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 February 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *8,9,11-13 and 19-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8,9,11-13 and 19-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to the claimed "node clusters" have been considered but are moot in view of the new ground(s) of rejection.

2. Applicant's remaining arguments filed 2/7/2008 have been fully considered but they are not persuasive.

3. Applicant generally argues that the teachings of Barthelemy and Collins would not suggest the implementation of "entirely new, scalable, computing systems" (Remarks 6) and that "the realization that the small world principle as claimed provides a methodology for designing and constructing massively scalable systems … is counter-intuitive in the face of pre-existing beliefs, and represents a genuine breakthrough in the art" (Remarks 8).

The Examiner acknowledges the two historical approaches to interconnecting large networks noted by Applicant (Remarks, 7-8), and agrees that they represented trade offs between complexity and path length. Barthelemy also discloses that these interconnection methods were old and well known at the time the invention was made (p. 3180, col. 1). However, Barthelemy also specifically disclosed that a "regular lattice" topology could be improved by rewiring a small number of links according to small world principles to obtain a new topology with the benefits of both regular lattice type networks

and random networks (p. 3181), namely a low average path length and high clustering (p. 3180, col. 2).

Barthelemy suggests applying small world principles to "information networks" in general (p. 3183, col. 1) and Collins suggests applying small world principles to computer networks in particular (p. 410). Collins also notes that "[a]lthough we are not in a position to design the Internet from scratch, [we can still make] small-world modifications" (p.410). It would have been apparent to one of ordinary skill in the art that the same principles used to improve an existing network could be used to construct an entirely new one as well.

"When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, §103 likely bars its patentability." *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1740 (2007).

When considering the combined teaching value of Barthelemy and Collins, one of ordinary skill in the art would have seen the benefits of using small world principles to construct scalable computer systems, and would have had no difficulty implementing them. The mere fact that that small world research originated in fields other than construction of scalable computer systems, as asserted by Applicant (Remarks 6-7), is insufficient to render the present invention non-obvious, particularly in light of the specific suggestions in the prior art to apply the research to the field of computer networks.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 8, 9, 11-13 and 19-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barthelemy ("Small World Networks: Evidence for a Crossover Picture") in view of Collins ("It's a small world") further in view of Attanasio et al (US 5,371,852).

6. With regard to claim 8, Barthelemy discloses a method for constructing a small world network, the method comprising:

providing a plurality of vertices (start from a regular network with n vertices each connected to z neighbors, forming neighborhoods)(p. 3181, col. 2)

providing a plurality of cross-links between the vertices (each of the vertices are connected to z neighbors, forming cross links between them)(p. 3181, col. 2);

directly connecting, using the plurality of cross-links, a corresponding plurality of pairs of vertices selected from the plurality of vertices in accordance with a selection process (apply the "rewiring" algorithm)(p. 3181, col. 2) resulting in a formation of a network of said plurality of vertices having a higher clustering coefficient of vertices in comparison with a corresponding randomly-connected network in combination with a

lower characteristic path length between the vertices in comparison with a corresponding regularly-connected network (only a few links must be rewired to form a small world network, which maintains neighborhoods [clustering coefficient] like a regular network while reducing the average path length to the same order as a random network)(p. 3180, col. 2, ll. 6-10; p. 3183, col. 1, ll. 21-34); and

wherein the steps of providing the plurality of cross-links and directly connecting the plurality of vertices in accordance with said selection process are repeated until the resulting network comprises a small-world network having an average path length between the plurality of vertices falling within a predetermined desired range, independently of a number of said plurality of vertices (once the links are rewired, the average path length is calculated; additional links may be rewired [by increasing *p*] to reduce the average path length as desired)(p. 3182; fig. 2 (a)-(b)).

Barthelemy fails to specifically disclose that the method may be used to construct a scalable computer system wherein the vertices are node clusters each comprising a single switching node and a plurality of computing nodes. However, Barthelemy expressly suggests that the small-world topology may be a promising topology for studies of known problems, including flow in “information networks”.

Collins also discloses various properties of small world networks and suggests several applications of small world networks. Collins explicitly suggests providing a few random cross links between nodes along the backbone of the internet, which could reduce the time needed to transfer information via the Internet. In light of these suggestions by Barthelemy and Collins, one of ordinary skill in the art would have had

good reason to apply the teachings of Barthelemy to computer networks and solve the problems noted by Barthelemy by implementing a computer system using a small-world architecture. Such a system would maintain a low average path length and high clustering, even for large numbers of nodes, reducing the time needed to exchange information among nodes on the network.

Attanasio teaches configuring a network with a cluster of computers comprising a single switching node (fig. 2; interconnect 110) and a plurality of computing nodes (fig. 2; nodes 105-108 and gateway 109), such that the cluster of computers appears to be a single computer to host computers outside the cluster (Abstract; col. 5, ll. 3-11). Replacing Barthelemy's "vertices" with computer clusters would have been an advantageous addition to the system disclosed by Barthelemy and Collins since it would have allowed clusters of computers to be interconnected in a small world network, and receive the accompanying benefits.

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Barthelemy, Collins and Attanasio to use clustered computer networks to construct a scalable computer system as claimed, since it would have provided more efficient communication between large numbers of nodes by maintaining a low average path length between nodes as the network size increased.

7. Claims 13 and 19 are directed to a “scalable computer system” constructed using the method discussed regarding claim 8. Since performance of the method of claim 8

would result in a scalable computer network as claimed in claims 13 and 19, these claims are rejected under the same rationale as claim 8.

8. With regard to claims 9 and 22, Barthelemy further discloses that the selection process is a random or pseudo-random process (p. 3181, col. 2).

9. With regard to claims 11, 12, 23 and 24 while the system disclosed by Barthelemy shows substantial features of the claimed invention (discussed above), it fails to specifically discloses that the predetermined range of the average path length between the plurality of nodes is less that 2.0, or, more specifically, between 1.5 and 1.7.

However, Barthelemy discloses that adding a few cross-links results in a large decrease in the average path length between nodes (p. 3180, col. 2, ll. 11-15; fig. 1), while maintaining the clustering of the system. One of ordinary skill in the art would have recognized that additional rewired cross-links could have been used, as needed, to reduce the average path length to a desired amount.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the number of cross-links to obtain an average path length less than 2.0, between 1.5 and 1.7, or any other range as desired.

10. With regard to claims 20 and 21, Attanasio further discloses that the switching node comprises a fiber optic switch (col. 7, ll. 25-28). Non-blocking, multi-wavelength

optical switches are known types of fiber optic switches, and Applicant admits that such interface blocks were "[c]urrently available" as of the time the invention was made (Spec. 9).

11. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Barthelemy ("Small World Networks: Evidence for a Crossover Picture") in view of Collins ("It's a small world") further in view of Attanasio et al. (US 5,371,852) further in view of Brewer (US 5,859,975).

12. With regard to claim 25, while the system disclosed by Barthelemy, Collins and Attanasio shows substantial features of the claimed invention (discussed regarding claim 8), it fails to disclose that each node has a plurality of interconnected processors.

Brewer discloses that the use of multiple processors in a single node of a distributed system is well-known in the art (Col 1, Lines 26-31). The use of multiple processors in a single node allows that node to process more information than it would be capable with only a single processor.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a plurality of interconnected processors in each node since it would have allowed the nodes to process more information that they would be capable of processing with only a single processor.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to AARON STRANGE whose telephone number is (571)272-3959. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glen Burgess can be reached on 571-272-3949. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Aaron Strange/
Examiner, Art Unit 2153